



Contest Rule of WER 2020 Brick Educational Robot Contest

“Internet of Everything”

1 Theme

The theme of the contest this year is “Internet of Everything”.

With the development of science and technology, the 5G era has arrived. 5G's ultra-strong bandwidth and extremely low latency have strong impact and wide application scenarios. Scenes in sci-fi movies, like long-range control, autonomous driving, smart home, smart city, will gradually become reality. The wide application of 5G has put people's imagination into realization, making people's life and work more efficient and convenient.

In the future, a wide range of products will have microprocessors and will be connected through a 5G network. At that time, household appliances such as televisions and air conditioners may switch on or off easily by voice or even brain waves. Home appliances are also likely to become “smarter”. They can understand each family users' personalities, hobbies and operating habits and can be automatically matched through intelligent recognition, more human-oriented and intelligent.

Of course, the development of science and technology will not always be smooth sailing. In the era of “Internet of Everything”, we also have to face various issues such as personal privacy and information security. How to solve these problems correctly and efficiently requires us to brainstorm and work together.

In this contest, contestants should play the role of engineers, use new structures and new technologies through brainstorm to create their own robots to complete various tasks, and also actively consider the possible drawbacks of the future information age, and how to prevent them.

2 Contest venue and surrounding

2.1 Venue



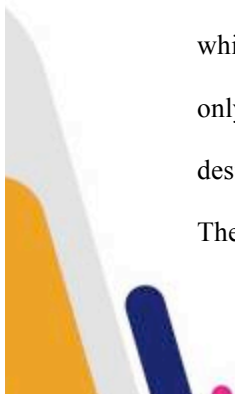


Figure 2-1 Arena Map

The dimension of the arena map (made of PU or PVC) is 220cm(length) x 120cm(width). The end of the black line (2-3cm in width) marks the position of a task model (model zone). The position and direction of models are variable. There is a base (30cm x 30cm) in the arena to which the robot can go back and leave in multiple times.

2.2 Surrounding

The contest surroundings are categorized into cold-light source, low-level lighting and magnetic interference-free. Due to the various uncertainties, for example: the surface of the arena is bumpy or zigzag, the lighting condition is variable, etc., the contestants need to come up with countermeasures when designing their robots.

3 Task and Score

There are 7 tasks for each round, including preset and additional tasks. 4 preset tasks will be drawn on the arena in terms of difficult, medium and basic levels; 3 additional tasks will be made public only before each specific round of the contest.

Contents of preset tasks are announced in the rule whereas the position and direction of models, which are variable, are published right before the contest. Additional tasks will be made public only before each specific round of the contest and contestants should refer to venue situation to design robot's building and programs.

The following preset tasks simulate some scenarios in real life:



3.1 Network Upgrading (40 points)

Difficulty level: ★★

3.1.1 Network upgrading task model can be put from Position 1 to 9 with fixed direction. Top and Bottom Networks are offline, and Bottom Network is attached to Signal Pole, as shown in Figure 3-1-1.

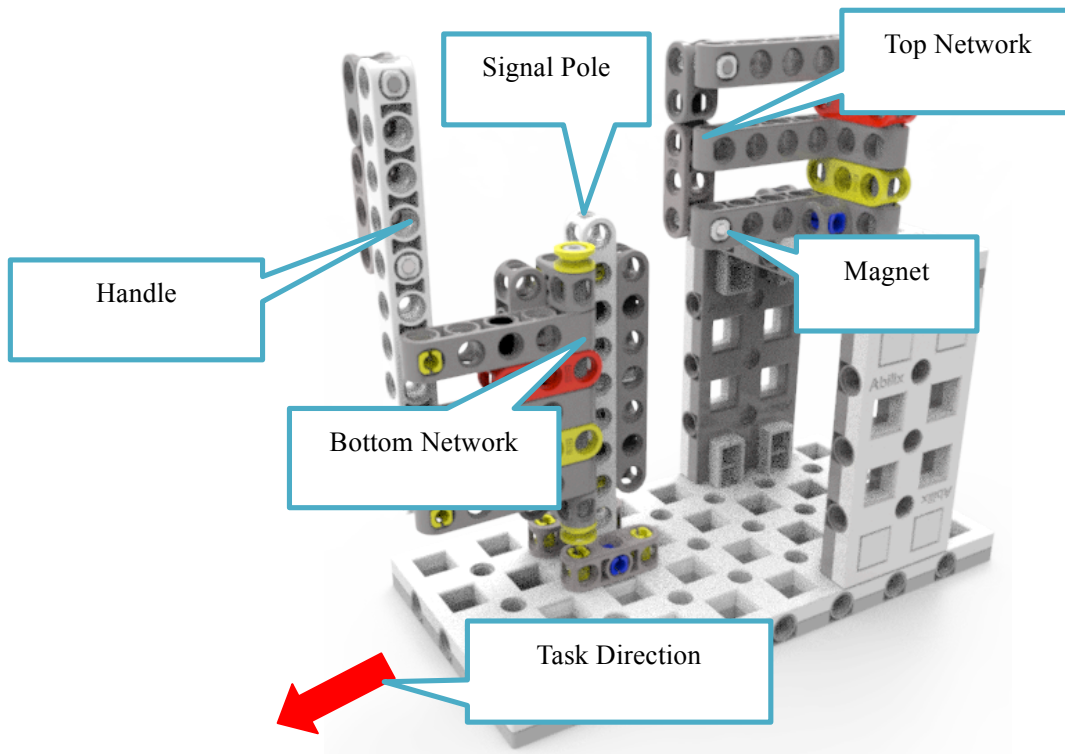


Figure 3-1-1 Network Upgrading Initial Status

3.1.2 By rotating the handle, Bottom Network is dis-attached with Single Pole and attached with Top Network (as shown in Figure 3-1-2, 40 points).

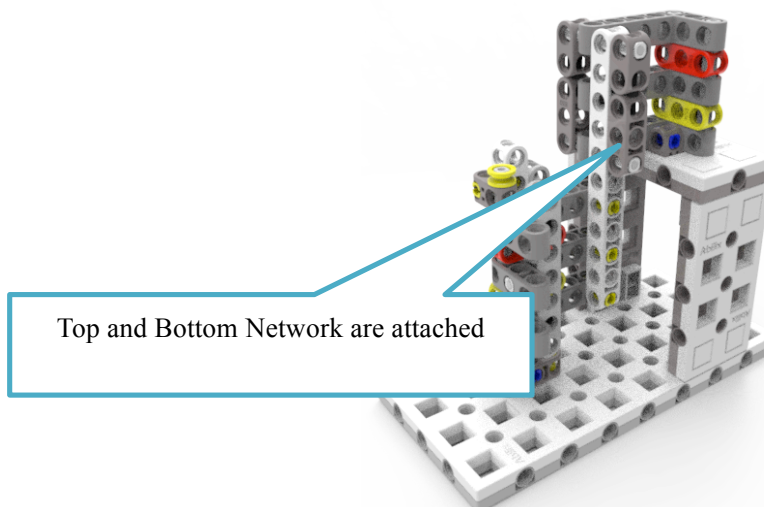


Figure 3-1-2 Network Upgrading Finished Status

3.1.3 If Top and Bottom Network are not attached, there won't be any points, as shown in Figure 3-1-3.



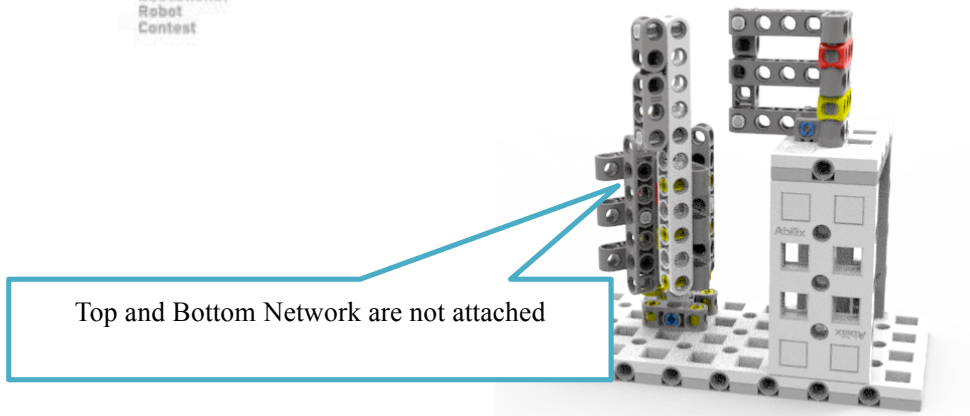


Figure 3-1-3 Network Upgrading Unfinished Status

3.2 Data Downloading (80 points)

Difficulty Level: ★★★

3.2.1 Data Downloading task model can be placed from Position 1 to 9 with fixed direction. Data is saved in hard disk whereas the handle is vertical to the red beam, as shown in Figure 3-2-1.

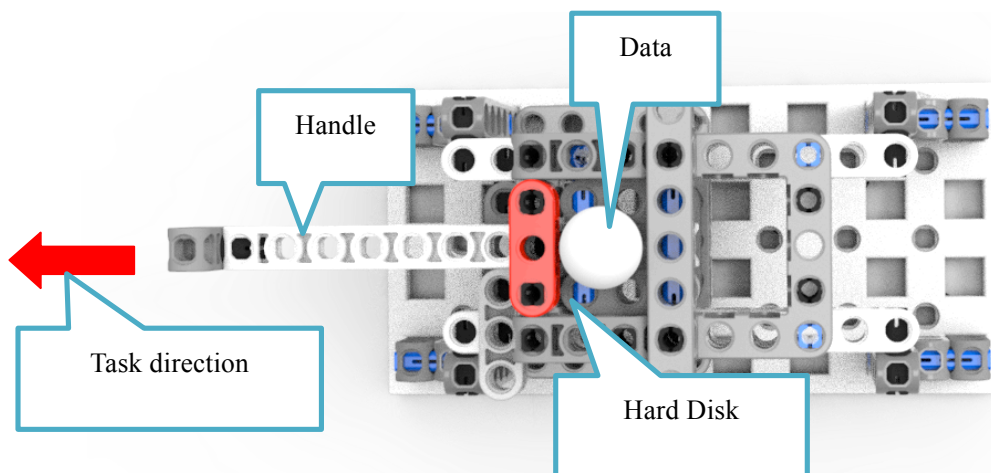


Figure 3-2-1 Data Download Initial Status

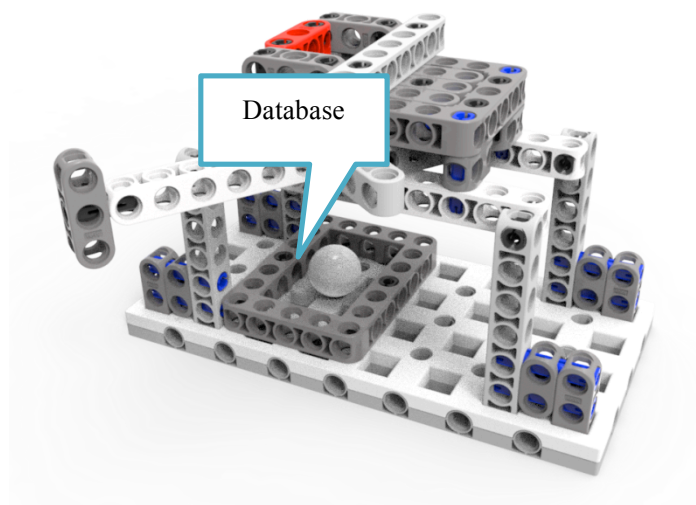


Figure 3-2-2 Data Download Finished Status



3.2.3 By pushing and rotating the handle, the data is downloaded to the database (as shown in Figure 3-2-2, 80 points).

3.3.3 If data is not downloaded into the database, there won't be any points.

3.3 Information Processing (100 points)

Difficulty Level: ★★★★★

3.3.1 Information Processing task model is placed at Position 10 with variable direction. 2 *Informations* are put on the top of the task model. The handle is locked by Stop Block in initial status. At the bottom of task model, there is an information collecting box for collecting *information*. The initial position of Information processing is shown in Figure 3-3-1.

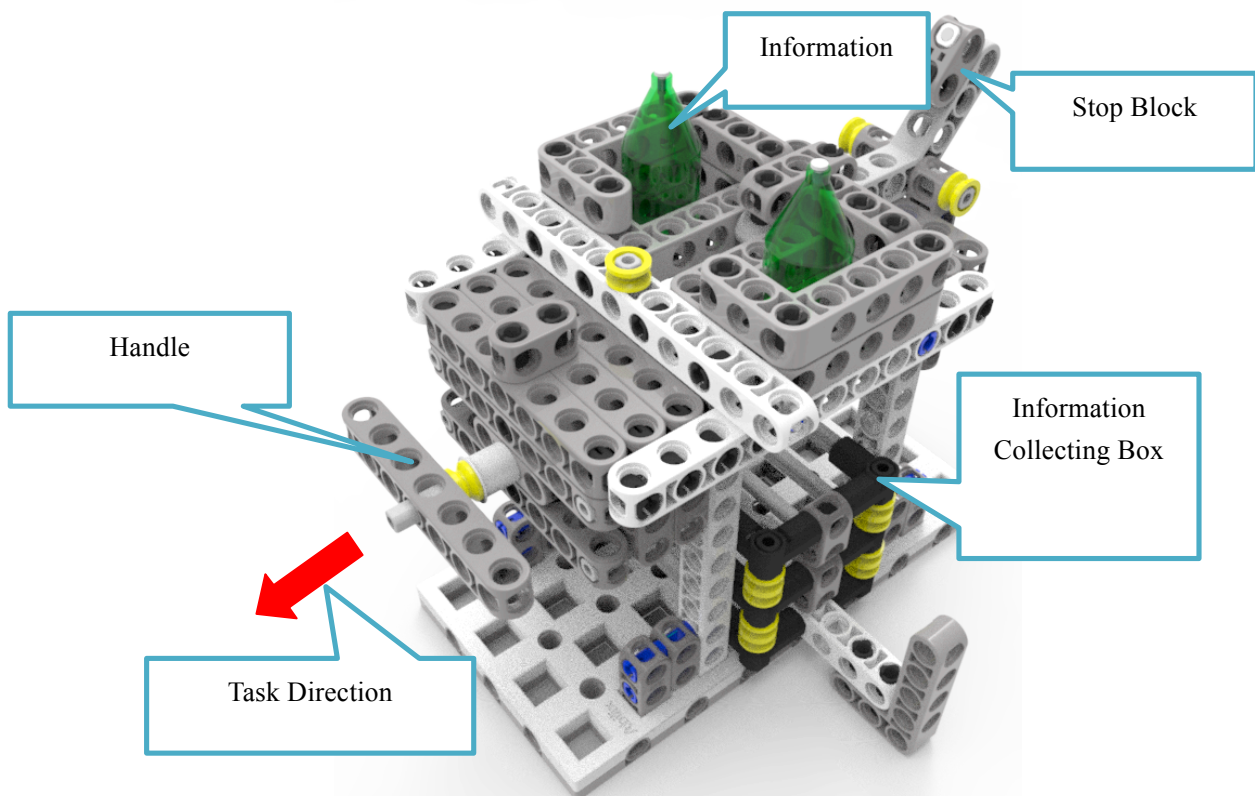


Figure 3-3-1 Information Processing Initial Status

3.3.2 Robot opens the Stop Block, the Finished Status 1 (as shown in Figure 3-3-2, 20 points).

3.3.3 By rotating the handle, the information will fall into information collecting box, the Finished Status 2 (as shown in Figure 3-3-3, 20 points per *information*).

3.3.4 Robot collects and brings the collecting box with information back to the base, the Finished Status 3 (as shown in Figure 3-3-4, 20 points per *information*).

3.3.5 Only when the collecting box with information detached from the task model and back to base can robot touch the information. During the operating process, robot shall not touch information directly, or there won't be any points.



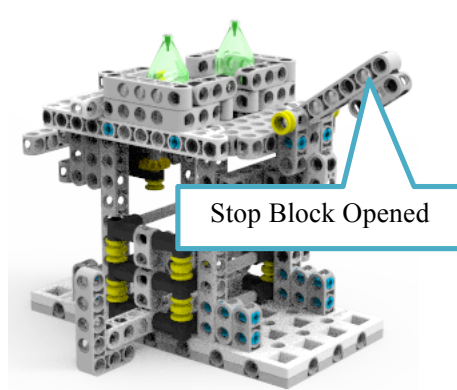


Figure 3-3-2 Finished Status 1

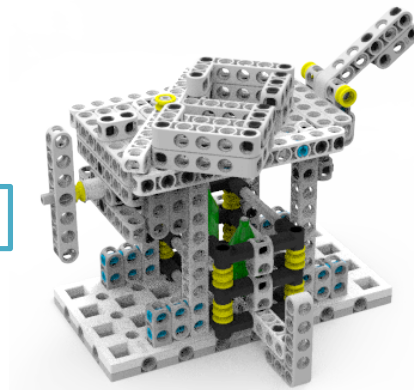


Figure 3-3-3 Finished Status 2

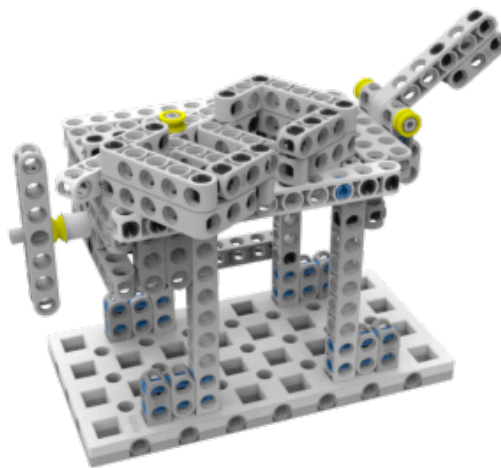


Figure 3-3-4 Finished Status 3

3.4 Information Coding (80 points)

Difficulty Level: ★★★

3.4.1 Information Coding task model can be placed from Position 1 to 9 with fixed direction. Network port is disconnected, as shown in Figure 3-4-1.

3.4.2 By pushing the handle, the network port is attached and connected, the Finished Status 1 (as shown in Figure 3-4-2, 40 points).

3.4.3 Robot must use the information collected in Task 3.3 to finish this task. There won't be any points by using other *informations*.

3.4.4 Robot makes the collected information attached to the magnet until the end of this round, the Finished Status 2 (as shown in Figure 3-4-3, 20 points per *information*).

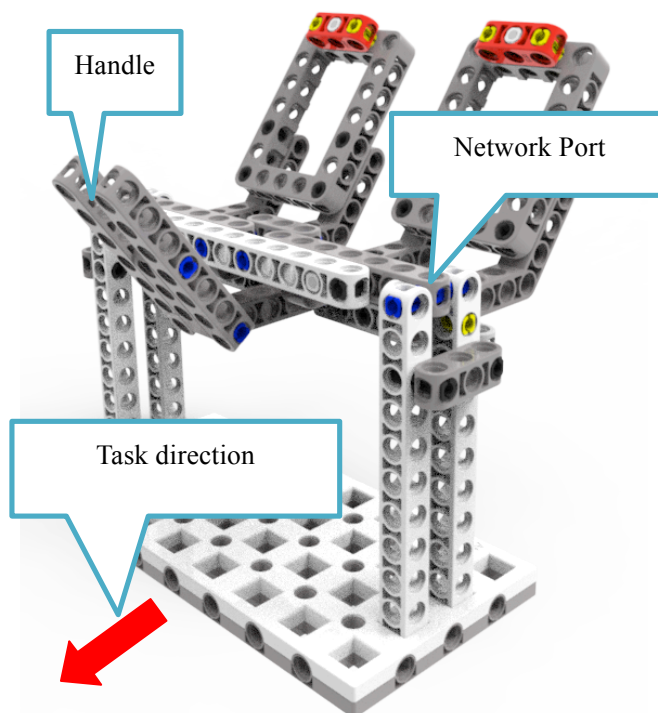


Figure 3-4-1 Information Coding Initial Status

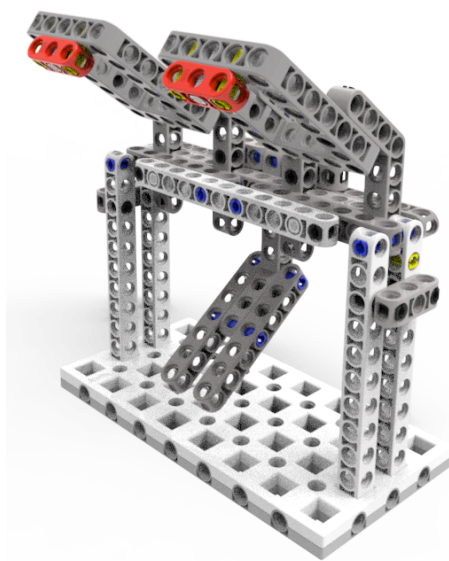


Figure 3-4-2 Finished Status 1

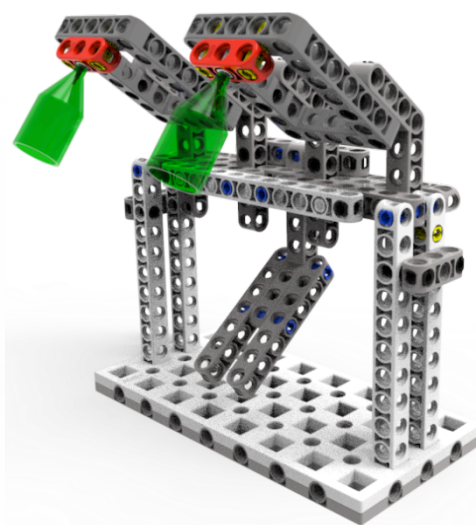


Figure 3-4-3 Finished Status 2

3.5 Position and Direction of Task Models

3.5.1 Position of some task models is fixed, but direction may change. Direction of some task models is fixed but position may change. All uncertainties will be released right before each specific round of the contest. Once released, there won't be any change in each round.

3.5.2 The direction of the task model of Network Upgrading, Data Downloading, and Information Coding is fixed, whereas their position may change, from Position 1 to 9. The task model of



Information Processing is placed at Position 10, but the direction may change.

3.5.3 Additional task models may be placed from Position 1 to 9. There are 3 additional tasks in each round. Task models and instructions will be released right before contest.

4 Robot

Robot's design and building rules and regulations: All robots must be checked before the contest. In order to guarantee the fairness, judge will randomly check contestants' robots during the contest and require those non-compliant robots to be adjusted in line with the regulations. If the robot still cannot meet the requirement, contestants will be disqualified.

4.1 Dimension: The dimension of robot shall not be larger than 30cm x 30cm x 30cm (Length x Width x Height) before taking off; the structure of robot can automatically extend after leaving the base.

4.2 Controller: The controller shall not be replaced during the single round. Each robot can only use one controller.

4.3 Actuator: Each robot can only use 4 motors in total (Digital servo motor is forbidden).

4.4 Sensor: The sort and number of sensors used by each robot are unlimited.

4.5 Structure: Robots must apply plastic splicing structure; accessories such as ribbons, screws, rivets, glue or tapes shall not be applied.

4.6 Power: Each robot must have individual battery with a voltage less than 9V, external power supply, boost, step-down or regulated power supply shall not be applied.

5 Contest

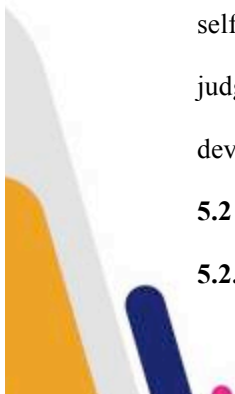
5.1 Team

5.1.1 Each team consists of 2-3 students (in-school students by June 2020) and one of the members shall be the team leader.

5.1.2 Contestants shall cope with all issues in the contest positively and voluntarily, with self-esteem and self-discipline, respect and kindly interact with teammates, opponents, volunteers, judges and all other people who have contributed greatly to the contest, and put into efforts to develop solid and sound qualities.

5.2 Rules

5.2.1 WER brick educational robot contest (4+3) is categorized into elementary, middle and high



5.2.2 Two or three rounds are involved in the contest (no preliminary or semi-final). The time of each round is 180 seconds.

5.2.3 Time will not be extended if the team chooses additional tasks.

5.2.4 After all rounds complete, teams will be ranked by their score in total, which is a sum of their score per each round.

5.2.5 It is of possibility that organizing committee alters the rules in terms of registration and practical situations.

5.3 Procedure

5.3.1 Build robot and program

5.3.1.1 Building and programming can only be conducted in preparation area while debugging can be performed in the arena map.

5.3.1.2 Contestants can enter the preparation area after registration. Judges needs to check the equipment carried by contestants. Built robots can be carried into the preparation area and all equipment must tally with the contest rules and regulations. Contestants are forbidden to carry telecommunication devices not approved by the organizing committee. After all contestants are seated in the preparation area, judges will notify teams of diagrams of model distribution and additional task rules.

5.3.1.3 Contestants should carry portable calculators, repair tools, replacement and spare parts. Contestants are prohibited to surf the internet or download any programs in the preparation area; contestants are also prohibited to shoot the venue by camera or other devices, or contact trainer or parents by any means.

5.3.1.4 There are 2 hours including debugging and sealing. Contestants can make use of the time to revise robot's building and program referring to the surroundings.

5.3.1.5 Daily lighting is applied on the arena and contestants can calibrate sensors accordingly, whereas the organizing committee will not guarantee the on-arena lighting is constantly invariable. The lighting may alter in the progress of contest due to flashlight of camera or camcorder, LED light or other unknown lights, so contestants should find solutions on their own.

5.3.1.6 Contestants must debug and prepare in order and trainers shall intervene by no means. Teams who disobey the order may be warned or even disqualified. Teams shall put robots in the



designated place of the sealing area before the end of the debugging time, afterwards, the arena is in closure.

5.3.2 Preparation before contest time

5.3.2.1 Contestants pick up their own robots and are guided by judges into the contest field. Teams who do not show up in the regulated time will be deemed as waiver.

5.3.2.2 Contestants shall stand near the base after entering the field.

5.3.2.3 Contestants put their robots in the base, of whose parts and shadows must maintain inside the base.

5.3.2.4 The present contestants shall complete the preparation within 2 minutes and give a signal to the judge after completion.

5.3.3 Start-up

5.3.3.1 After judge confirms the team is ready, he/she will count down from 3 while contestant can use a hand to slowly approach the robot. When hearing the command “Start”, contestant can touch the button or give the sensor a signal to start up the robot.

5.3.3.2 If the team starts up the robot before the command “Start” is given, the operation will be regarded as a mistake and the team will be warned or penalized accordingly (being counted as a restart).

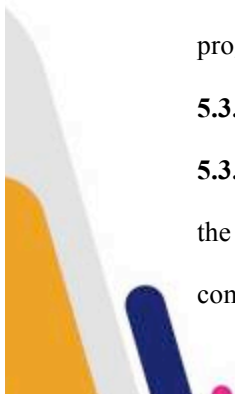
5.3.3.3 Once robot starts up, it will only be controlled by the controller’s in-built programs. Generally speaking, contestants shall not touch robots (Restart is exceptional).

5.3.3.4 Contestants shall not deliberately detach components or drop components on the ground, and such behaviors with a deliberate intent will be judged a foul. Any unintentionally dropped components shall be cleaned out of the arena instantly by the judge. Robot being scored due to detached components shall be invalid. Detached components indicate at a certain moment there is no connection between robot’s built-in components and robot’s body.

5.3.3.5 If the carried objects are cast out of the arena accidentally because of robot’s rapid speed or program error, the objects shall not be back to the arena.

5.3.4 Restart

5.3.4.1 If dysfunction occurs or certain task is not completed in the progress, contestants can take the robot back to the base to restart and a “Restart” will be recorded; the tasks which are completed before “Restart” will be scored accordingly while the carried object during the





dysfunction or task failure becomes invalid and will be kept by judge till the end of the contest.

Timing will not be paused during the process.

5.3.4.2 Score: In each round, Restart 0 times, the team gains 40 points; Restart once, the team gains 30 points; Restart twice, the team gains 20 points; Restart 3 times, the team gains 10 points; Restart 4 times or above, the team gains zero.

5.3.4.3 Time to Restart is of no limit in each round, but point-gaining will comply with 5.3.4.2.

5.3.4.4 Timing will not be paused or restarted during Restart period.

5.3.5 Robot can go back to the base autonomously.

5.3.5.1 Robot can go back and forth time and again, which will not be counted as a Restart.

5.3.5.2 The criterion of robot autonomously going back to the base is its vertical shadow lying in the base and contestants can touch robots which are already back to the base.

5.3.5.3 After robot autonomously goes back to the base, contestants can alter or repair robot's structure.

5.3.6 End of contest

5.3.6.1 Each round has 180 seconds.

5.3.6.2 After the team accomplishes some tasks, they shall give a signal to judge if they decide to give up in the contest, the judge will stop timing and keep the currently used time for a single round; otherwise, the team has to wait till the end of the contest (Judge blows a whistle).

5.3.6.3 After judge blows a whistle for the ending of the contest, contestants must power off the robot instantly and leave the robot and all objects on arena untouched.

5.3.6.4 Judge fill in the scoring sheet and tell contestants their scores.

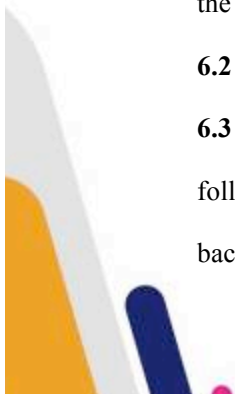
5.3.6.5 Contestants clear up the arena and move their robots back to the preparation area.

6 Score

6.1 Score the team based on their task accomplishment at the end of each round. Details are list in the 3th section.

6.2 The sequence of accomplishing tasks will not influence the score of a single task.

6.3 Some tasks can only be scored after the model is carried back to the base, meanwhile, the following requirements must be matched: 1. The criterion defining robot autonomously going back to the base; 2. The shadow of robot and that of the model are partially or utterly overlapped,





or robot contacts the model.

7 Foul and Disqualification

7.1 The score of the team who does not show up on time will be deducted 10 points for every minute; if the team still does not show up in 2 minutes, they will be disqualified then.

7.2 Judge will give a warning to the team for their 1st mis-start, robot should be back to the base area for a Restart and timing will be restarted. The 2nd time mis-start will lead to the team's disqualification.

7.3 Detaching components intentionally is regarded as a foul. The team may be disqualified depending on the seriousness of the situation.

7.4 If the model is damaged by robot or contestants in the progress, intentionally or not, contestants will be given a warning. The task, no matter completed or not, will not be scored.

7.5 Neither the model nor robot shall be touched out of the base during the process, otherwise, a "Restart" will be recorded.

7.6 Contestants who disobey judge's directions will be disqualified.

7.7 Contestants will be disqualified if they privately contact trainer or parents without a permission of judge.

8 Rank

Each team will be ranked based on their score in total of all rounds, the higher the score is, the higher the ranking will be. If there are teams scored the same, see followings to determine the ranking:

- 1) The team who used less time for all rounds will be ranked higher;
- 2) The team who restarts less will be ranked higher;
- 3) The team who completes more single tasks in all rounds will be ranked higher;
- 4) The team whose robot is less-weighted will be ranked higher, or the result will be decided by judge.





Appendix Scoring Sheet

WER 2020 Brick Educational Robot Contest (4+3)							Round <u> </u>
Scoring Sheet							
Arena & Seat		No.		Team		Category	

Tasks		Points	Status	Score
Network Upgrading (Maximum: 40 points)	Top Network and Bottom Network are attached	40		
Data Downloading (Maximum: 80 points)	Data is downloaded to the database	80		
Information Processing (Maximum: 100 points)	Stop Block is opened	20		
	Information falls into information collecting box	20/each		
	Collecting box with information enters the base	20/each		
Information Coding (Maximum: 80 points)	Network port is attached and connected	40		
	Information is attached to the magnet	20/each		
Additional Task 1	Details to be confirmed	100		
Additional Task 2	Details to be confirmed	100		
Additional Task 3	Details to be confirmed	100		
Autonomous Operation	40-(number of restart)*10. The score should be no less than zero.			
Total Score				
Time				

Remarks on disqualification: _____

Judge: _____ Scorekeeper: _____

Contestants: _____

Chief Judge: _____ Data Entry By: _____